

Mitigation of road construction induced land degradation effects on livelihoods: A case of rural access programme Nepal

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1. Abstract

Road building on geologically vulnerable slopes can trigger erosion, mass wasting and sedimentation. Disturbance of the natural drainage systems and making deep cuts and fills across already fragile slopes are the main causes. This often leads to excessive land degradation of land areas adjacent to the road. These effects have a direct bearing on the livelihoods of people who survive by subsistence agriculture farming. The engineering solution of balancing soil mass between cut and fill is good practice, but is almost impossible to attain in the rural hills of Nepal. Side casting is unavoidable and has become a major cause of land degradation.

Based on past experience, the Rural Access Programme (RAP) has adopted labour-based, environmental friendly and participatory approach of road construction coupled with bioengineering measures to control erosion, mass wasting and sedimentation to minimize land degradation. Unlike conventional road construction techniques, RAP has adopted the "Green Road Concept" - phased construction without blasting or heavy machinery. RAP uses road construction as the entry point for social and economic development programmes to improve and sustain livelihoods of the directly affected project families of the poorest of the poor people living within the zone of influence (90 minutes walk) of the road. Thus RAP has intervened through physical, social and economic development programmes to reduce land degradation effects of road construction on livelihoods.

RAP works with local road building groups having 15 to 20 members per group and has over 12,000 members working on 307 km length of road construction, including bioengineering and environmental management activities. Wages are paid on a task work basis, shared between group members based on days worked by each member. They are encouraged to save 10% of their wages in group savings and credit schemes, used to lend among the group members for other income generating activities. Initial results of the programme are very encouraging, indicated by significant reductions in the interest rates charged by the informal moneylenders operating in an environment where formal financing institutions are beyond reach. Also, degraded land outside the road corridor but within the right-of-way, has been put to use as a means of livelihoods by roadside neighbours and by road building groups during the operation phase of the road.

The paper deals with the socio-economic aspects of land degradation and the mitigation measures adopted to minimise the effects. It also shares the experiences and challenges faced by rural people of the programme areas with the intellectual community, as promoted by the Global Transport Knowledge Partnership gTKP.

2. Introduction

Situated in the lap of Himalaya, Nepal is located in between the latitude 26° 22' N to 30° 27' North and longitude 80° 4' E to 88° 12' East, and the elevation ranges from 90 to 8848 meters. The mean length is 885 km east to west and the average breadth is about 190 km north to south. The country borders the two most populous countries of the world, India to the east, south and west and China to the north. Nepal is a land locked country and a place of natural beauty and the home of many artefacts. Nepal is predominantly an agricultural nation, with agriculture contributing 38.7 % to the gross national product. Although efforts have been made to provide basic needs to its rural people since the late fifties through successive national development plans, most of the people still do not have access to roads, piped water supply, electricity, communication, education and health facilities to the planned service levels.

The average road length per sq km of land area is only 120 metres. 39% of people living in the hilly regions have no access to all weather roads within 4 hours walking distance. Likewise, 13% of people living in the flat Terai region lack access to all weather roads within the walking distance of 2 hours. To meet these Government targets, an additional 8,000 km of rural roads are needed. Many people in the hilly and mountainous regions lack access to rural roads and are forced to remain dependent on foot trails and horse trails. Regarding roads as the most effective vehicle for rural economic development, the Government of Nepal has set roads and the transport sector as high priority. Building all weather roads in the mountains is very costly and calls for investments beyond the reach of Government. Despite the continued efforts since the first five-year national development plan drawn up in the late 1950's, the Government of Nepal has been unable to fulfil this Herculean task of road construction in the country. In order to fill financial gaps at the requests of Government of Nepal, various development partners have joined hands with the Government to provide financial and technical assistance with the aim to develop the transport sector and help meet the accessibility targets set in the national development plans and millennium development goals.

3. Road Construction Effects on Rural Livelihood

Road construction in mountainous areas certainly provides transport facilities to the rural people, but it can also bring a number of negative effects too. These include the disturbance of naturally balanced mountain environments that can result in deterioration of livelihoods of the rural people living in an agricultural subsistence economy. Use of land to provide the road formation width, the construction of side drains, retaining walls and breast walls, the degradation of cultivated land due to side casting and the effects of spoil spillage on downside land areas are all factors directly affecting the livelihoods of the people. Project affected families are the victims of road construction whilst many of their neighbours are the project beneficiaries. Many of the road construction programmes of the past have had a positive impact on poverty, but the benefits have been unevenly distributed. The poorest have benefited least, and have sometimes been worse off after road construction.

The average land holding per household in the rural hills of Nepal is only 0.66ha. This means that some households will lose significant proportion of their land to the road construction. The average land area needed in the hills for the roadway itself is 3% of the cultivated land of the directly project affected households, or 7-10 % including the right of way¹ of roads built to the district road standards in Nepal. For feeder road standard these figures are 5% and between 15-20 % respectively. The negative impact is highest on district roads where the land has to be provided for the common good with no compensation. In addition to the loss of land, the effects of mass wasting and sedimentation triggered by the road construction has contributed to degrade the quality of land resulting in a decrease in productivity, especially on sections with greater cross slopes and longitudinal gradients. All these factors can seriously affect the livelihoods of local people.

Conventional methods of road construction, using heavy machines, equipment and explosives has an even worse effect on agricultural livelihoods, and to date, usually without any attention on livelihood support programmes for the project affected people, and few controls in maintaining the naturally balanced mountain environment. Past efforts of road construction by conventional methods show that we could neither attain a stable road nor control the negative effects on livelihoods due to increased mass wasting and sedimentation. Excessive use of explosives during construction has triggered a high rate of mass wasting and sedimentation, especially in the geologically unstable locations found so often in Nepal.

Owing to the degree and frequency of negative environmental impacts arising from conventional construction methods, resulting in irreparable losses to the livelihoods of rural people, an alternative approach of road construction has been tried. The objective is to use methods that least affect the environment and where low cost mitigation measures can be carried out using with local community participation. It was expected that new road building approaches be implemented maximizing community level inputs, in combination with limited use of equipment, could derive better results with livelihood support programmes working in parallel. In Nepal, development experts have seen the advantages of changing from the conventional approach of road construction, and have started to implement programmes using a labour-based, environmental friendly and participatory (LEP) approach.

4. The Programme Implementation Approach

RAP is a pro-poor programme by the Government of Nepal with grant assistance since 2001 from DFID-UK. The primary objective of the rural access programme is “to improve poor people’s access to the goods, markets and services that they value in targeted hill districts of Nepal”. The programme links transport development and poverty alleviation through a participatory approach that ensures benefits to the poor and excluded section of the community. The programme is constructing 307 km of roads² to an earthen standard by June 2008, following a “transport plus” approach by simultaneously implementing complimentary activities for the poor and excluded people living in the zone of influence of the new roads. Improved access is an inclusive benefit because all members of the community benefit, regardless of poverty status. In practice, the poorest and excluded people need special consideration to ensure that they are not marginalised by in the process. Using the lessons learnt from similar projects, RAP targeted the directly project affected families, and the poorest and marginalised groups for primary support through work opportunities in Road Building Groups (RBGs), comprising 15-20 people in a group. The RBG members live within the zone of influence and are given road construction work for wages. Under the RAP, over 12,000 extremely poor and disadvantaged households have mobilised one family member each to do paid roadwork during slack agricultural labour seasons. The programme intervenes at two levels, supplementing the livelihoods of targeted poor subsistence farmers with their first wage earning opportunity, and then introducing them to alternative and sustainable income generating activities.

¹ RoW ranges from 10m to 30m from either side of the centre line of the road alignment based on the type of roads in Nepal.

² The length includes total road length in five eastern cluster hill districts (Terhathum, Dhankuta, Sankhuwasabha, Bhojpur and Khotang) under the programme.

4.1 Road Construction

The RAP roads are constructed in a phased labour-based manner using RBGs to minimize environmental impacts and disturbances at each stage. The implementation approach strictly adheres to the *green road concept*³ maximising participation of local people during the planning and road construction phases with the limited use of small machines for breaking the hardest rocks. The construction adopts a transverse cut to fill method to achieve mass balance and progressively extend the road cross-section width allowing the new construction to stabilise better in the fragile hill environment, reducing any bad environmental impacts and taking a longer time to complete. This engineering approach aims to avoid the difficulties and negative outcomes observed in other road projects, especially the ones affecting adjacent land by erosion and sedimentation. The adopted approach is technically appropriate and institutionally acceptable, and at the same time provides opportunities for poverty reduction, a sense of local road ownership and develops local road skills to people who could be involved later with road maintenance.

4.2 Social and Economic Development

The transport element of RAP is supported by extensive complementary activities. These include support to local institutional capacity building and the enterprise development of poor and excluded people involved in road building works, achieved through social and economic development programmes. These mainly extend the present agricultural knowledge base using some demonstrations and technical backstopping support to ensure that affected stakeholders are informed about new opportunities that can sustain new rural livelihoods of poor, excluded and directly project affected households. The RAP intervention starts with the idea of group saving and lending. The RBG members save part of their wage (10%) in a fund, which they lend within the group members at interests fixed by the group at their monthly management meetings facilitated by RAP NGOs. Proposals are put forward by individuals for feasible income generating activities, and the group approves, or not, loans and repayment terms in made in rotation as their capital permits. The average group saving has surpassed US\$ 1,500.00 and is expected to be at US\$ 1,800.00 by the end of project period. The amount of lending to savings ratio is greater than 3, using the money three times over and gaining interest for the members. On average, members have used 67% of loans to support income-generating activities, the remainder on consumption items such as medical and educational needs, and important family festivities. The total wage payment to RBG members is estimated at US\$ 9 million by the end of programme period with corresponding total group saving of US\$ 0.9 millions. Increased awareness by RBG members about the worth of group saving and lending practices, is leading to a high proportion of groups indicating that they will be continuing their schemes post-construction phase, thus helping to sustain livelihoods of the targeted poor and excluded people.



Road construction in slope terrain



Spoil containing breast wall

4.3 Environmental Mitigation and Monitoring

Environmental considerations are fundamental to the RAP road construction approach. Best environmentally friendly practice has been adopted and regularly monitored in order to minimize negative environmental impacts. In order to internalise environmental considerations in road development, RAP used an environmental checklist during alignment selection, and then ensured mitigation measures through regular environmental monitoring. These steps led to the provision appropriate drainage systems and water management structures, and promoted surface protection and erosion control by using bioengineering methods even beyond the right-of-way. RAP has insisted on reinstatement of existing infrastructure such as mule trail connections and utilities damaged or diverted during road construction. A fundamental part of the RAP approach is the environmental assessment and monitoring as called for by Government regulations, but rarely carried out on other programmes.

³ Road construction activities proceed in a phased-wise manner with opening of trail, gradual widening, construction of structures and finalization, including bioengineering in subsequent years to allow natural consolidation.

5. Land Degradation and Reclamation

In common with other hill roads in Nepal, RAP roads have a land take of about 3 percent of the cultivated land owned by the directly project affected households. The land taken for the road is acquired with cash compensation in the case of feeder roads, but without any formal compensation for district roads. More land is sometimes subsequently lost outside the right-of-way owing to land degradation due to intense erosion and sedimentation fuelled by the cut and fill operations along mountain slopes. Despite the application of mass balance approach, effects of side casting on adjacent land especially in sections with greater cross sectional areas and steep longitudinal gradients. In addition, the inevitable disturbance of natural drainage, irrigation systems and terraces, and the loss of highly fertile topsoil all contribute to a decreased the agricultural productivity that ultimately affects the subsistence livelihood of the people.

Contrary to past projects using conventional road construction methods, the RAP approach has greatly helped to minimize land degradation. Through sensitive design and environmental mitigation, monitoring and enhancement programmes, RAP has done much to prevent environmental damage, and has applied resources to reinstate land to the *ex-ante* condition, with physically improved terraces. Reinstatement of land to the former quality has not always been achieved immediately, and it will still take time and effort to restore land fertility.

6. Creation of Alternative Means of Livelihoods

Realising the impacts on livelihoods due to adverse environmental effects, RAP has implemented a number of income generating activities in order to minimise effects on livelihood of directly project affected families as well as improving the livelihoods of the poor and disadvantaged people involved in RAP road construction. Income generating activities are launched with funds from group saving schemes, with technical support from the programme. The IGAs are mostly agricultural but a small proportion of members are encouraged to open businesses such as a retail shop or tailoring. RBG members have to start their new income-generating activities in parallel with their work on road construction. Initial take up of income generating activities is very encouraging and are expected to benefit from the newly available road connection, and better access to markets.

7. Conclusion

The labour-based, environmental friendly and participatory (LEP) approach of road development by RAP has succeeded in opening up districts with earthen roads whilst using the road building activity to provide an entry point for extreme poor and disadvantaged people to permanently improve their livelihoods. By mobilizing local labour groups rather than using contractors, has helped to ensure environmentally sound practice in its road construction. Also, since the labourers belong to the local communities and from directly project affected families, they feel a sense of ownership, always trying to minimise the bad effects of road construction by optimizing the vegetation clearance area and side casting activities, and by building low dry stone walls for spoil management control to the extent possible. Treating environmental mitigation measures as paid work just as for initial road opening has led to their acceptance as standard practice in RAP road construction. Although the LEP approach of road development has contributed in minimizing the land degradation effects in general, more effort is needed to avoid the effects of land degradation on the livelihood of people living within a subsistence economy. Spoil management, the construction of toe walls to retain spoil spillages and the use of areas within the right-of-way for income generating purposes, have all helped to sustain livelihoods and to minimise land degradations in adjacent cultivated land along road corridors in the RAP hill areas of Nepal.

8. References

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